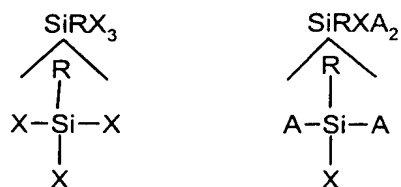
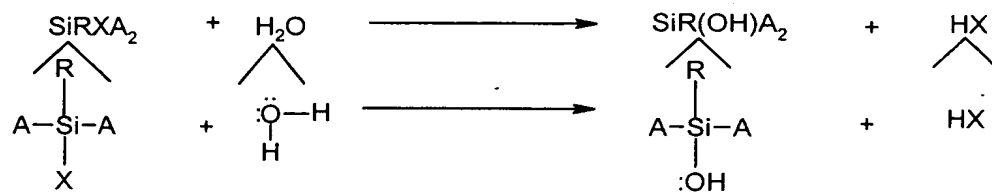


**FIGURE 1: REPRESENTATIVE ORGANOSILANES**

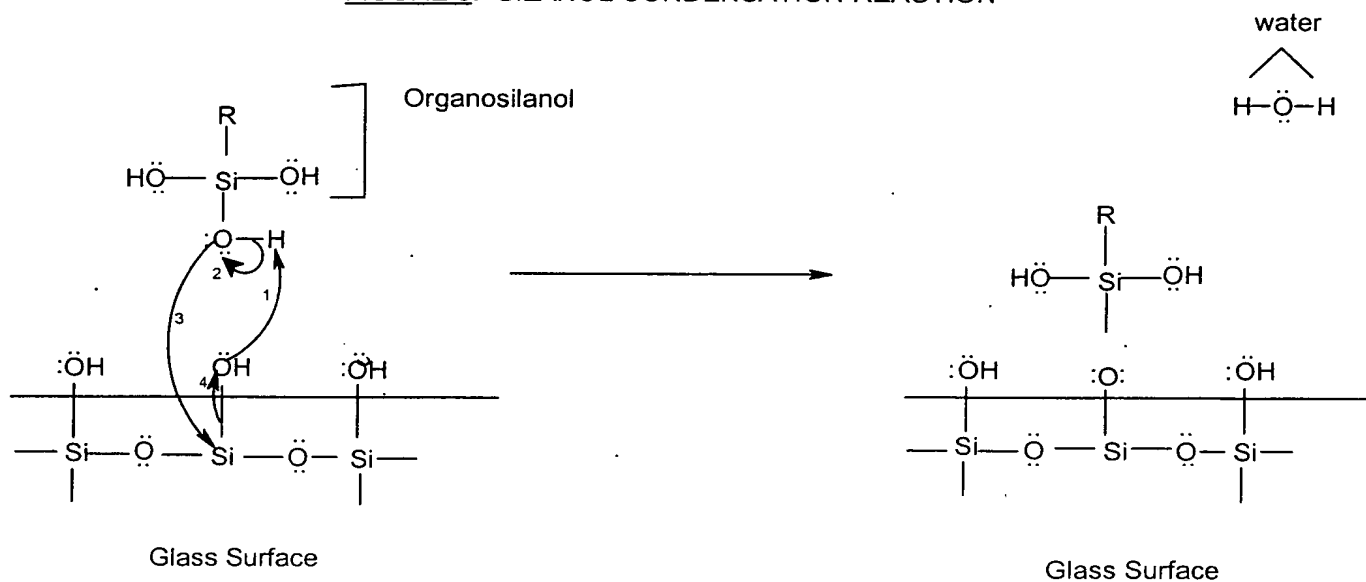


R = functional group of chemical interest  
A = non-reactive group  
X = hydrolyzable group

**FIGURE 2: HYDROLYSIS OF AN ORGANOSILANE TO PRODUCE AN ORGANOSILANOL**

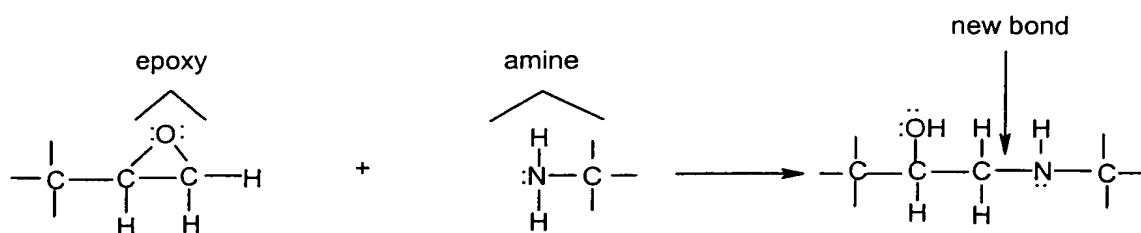


**FIGURE 3: SILANOL CONDENSATION REACTION**

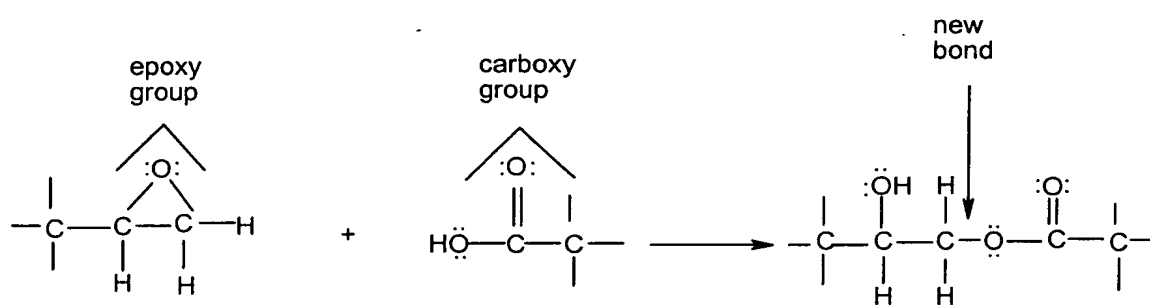


**FIGURE 4: REACTIONS OF EPOXY GROUPS**

**A: With an amine group**



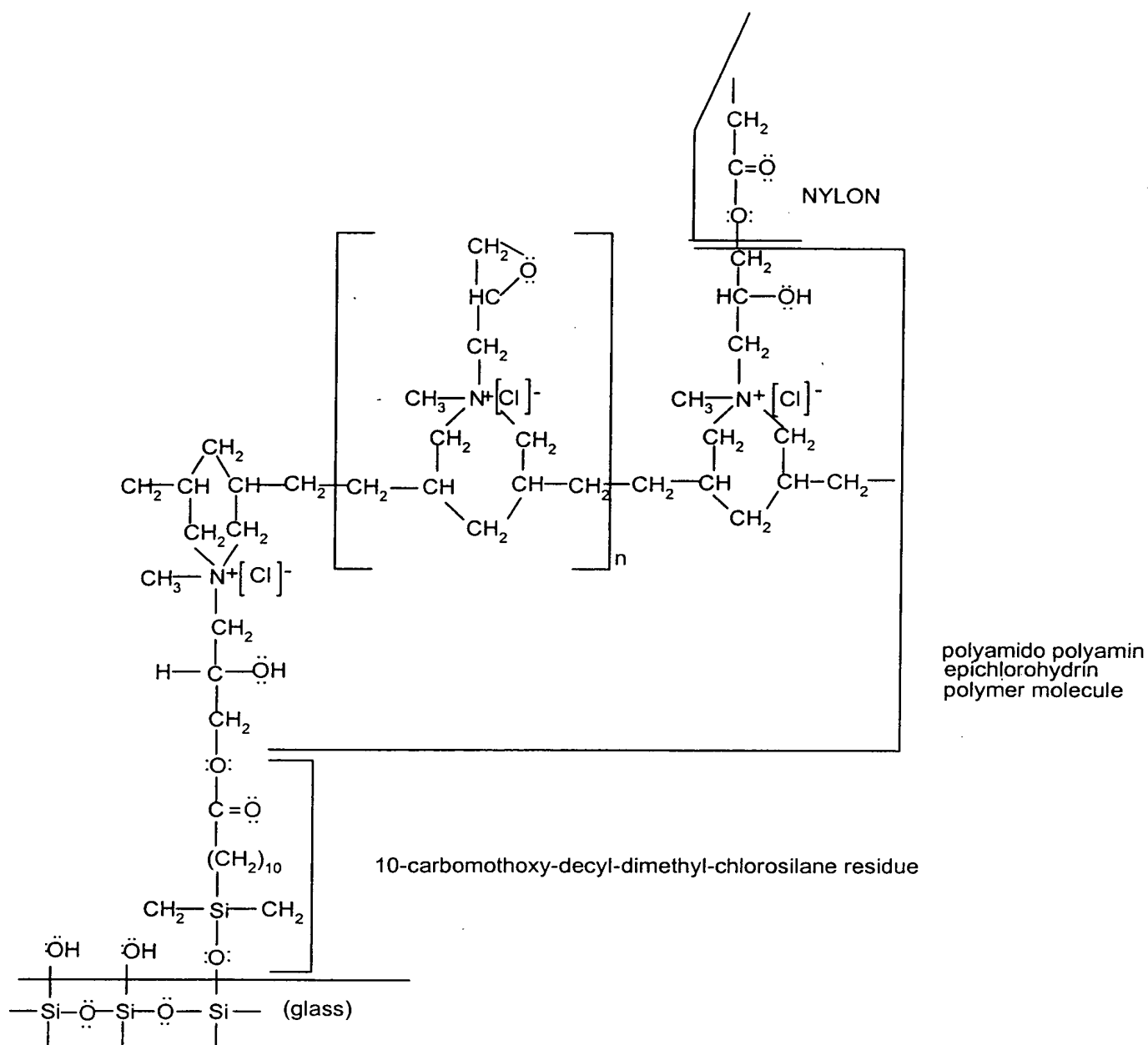
**B: With a carboxyl group**



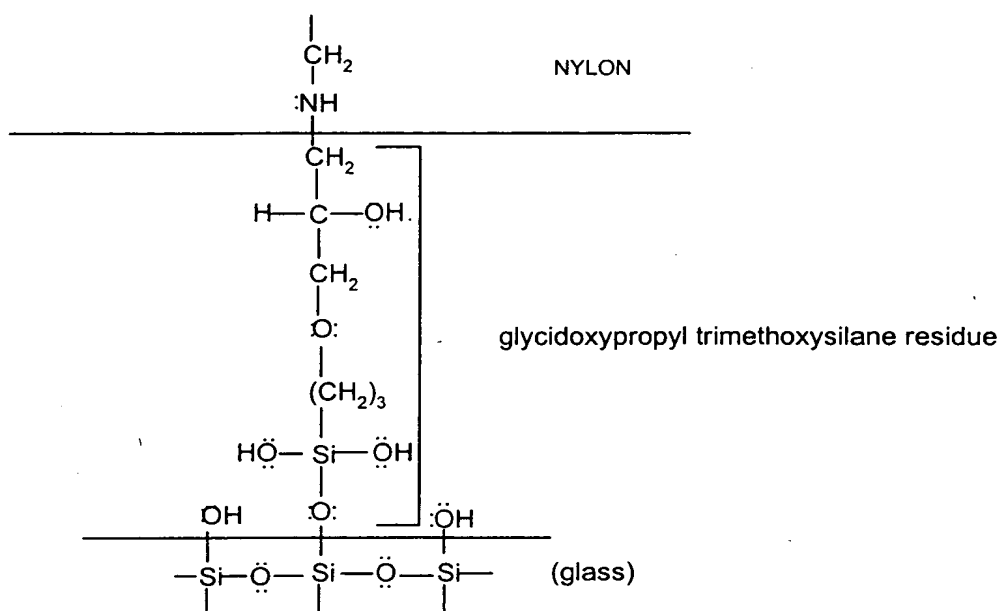
The diagram illustrates the chemical structure of a polymer molecule, showing its various components and their connections:

- NYLON:** A segment of the polymer chain, shown as a repeating unit in brackets with a subscript  $n$ . It consists of a hexamethylene diamine derivative (with a quaternary ammonium group,  $\text{N}^+\text{CH}_3\text{Cl}^-$ ) and a terephthalic acid derivative (with a quaternary ammonium group,  $\text{N}^+\text{CH}_3\text{Cl}^-$ ).
- polyamido polyami epichlorohydrin:** A segment of the polymer chain, shown as a repeating unit in brackets with a subscript  $n$ . It consists of a hexamethylene diamine derivative (with a quaternary ammonium group,  $\text{N}^+\text{CH}_3\text{Cl}^-$ ) and a terephthalic acid derivative (with a quaternary ammonium group,  $\text{N}^+\text{CH}_3\text{Cl}^-$ ).
- 3-amino propyl triethoxysilane residue:** A segment of the polymer chain, shown as a repeating unit in brackets with a subscript  $n$ . It consists of a hexamethylene diamine derivative (with a quaternary ammonium group,  $\text{N}^+\text{CH}_3\text{Cl}^-$ ) and a terephthalic acid derivative (with a quaternary ammonium group,  $\text{N}^+\text{CH}_3\text{Cl}^-$ ).
- polymer molecule:** The overall structure, showing the polymer chain (NYLON, polyamido polyami epichlorohydrin, 3-amino propyl triethoxysilane residue) and its connection to the glass substrate.
- glass:** The substrate material, represented by a horizontal line with silicon atoms ( $\text{Si}$ ) and oxygen atoms ( $\text{O}$ ) forming a network. The silicon atoms are bonded to hydroxyl groups ( $\text{OH}$ ).

**FIGURE 5B:** Bond using 10-carbomethoxy-decyl-dimethyl chlorosilane and polyamido polyamine epichlorohydrin polymer.



**FIGURE 5C:** Bond using glycidoxypopyl trimethoxysilane



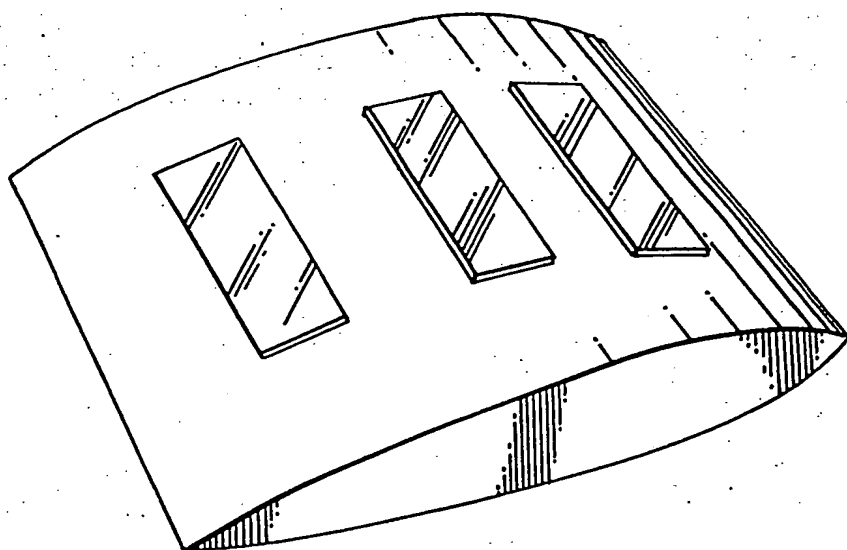


FIG. 6A

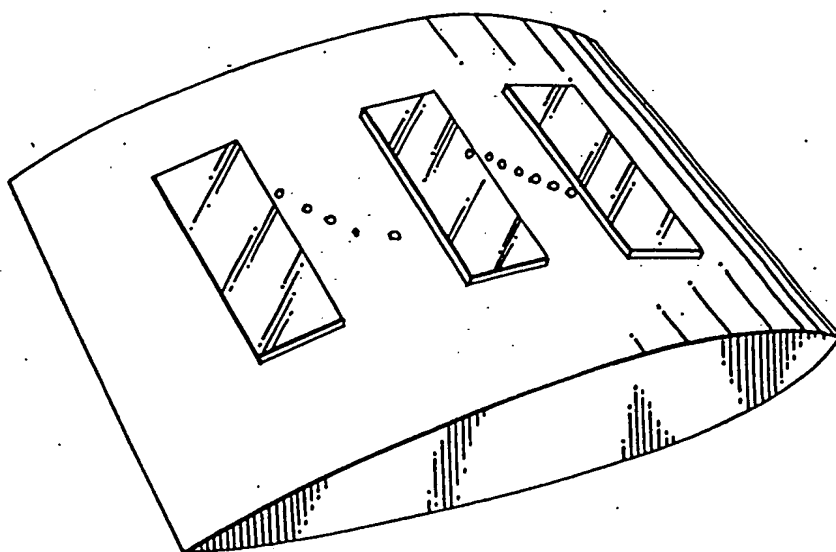


FIG. 6B

FIG. 6C

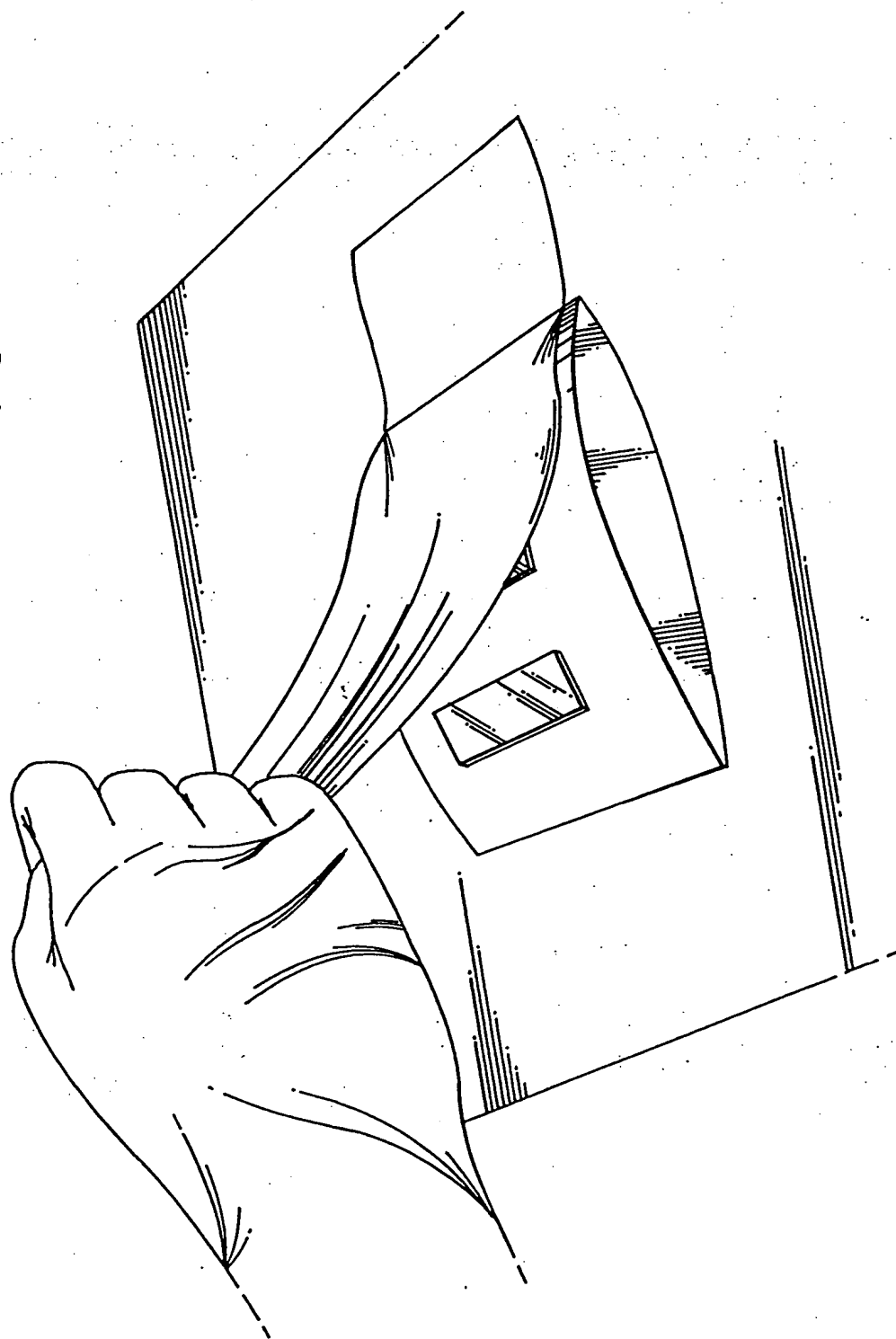
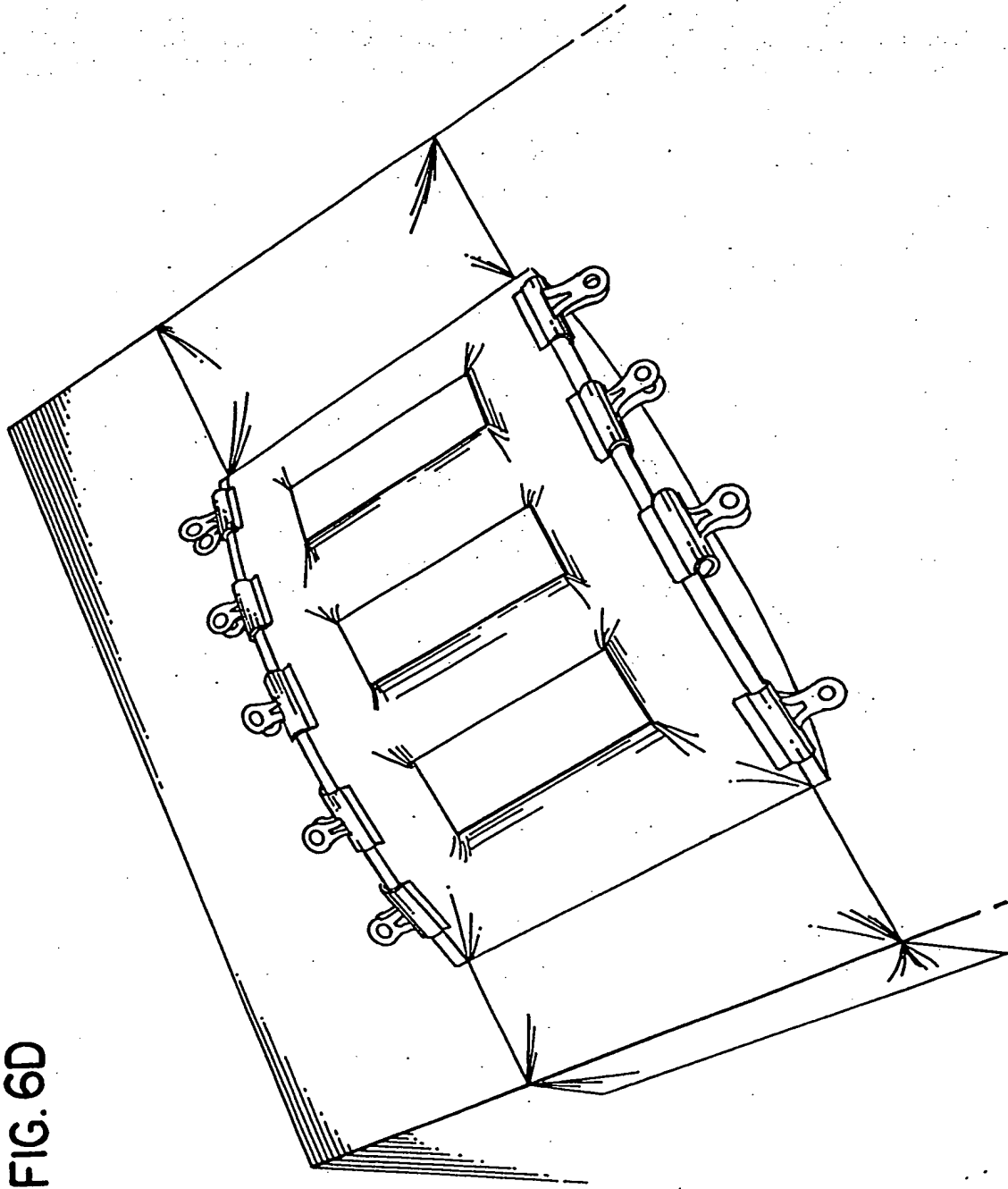


FIG. 6D





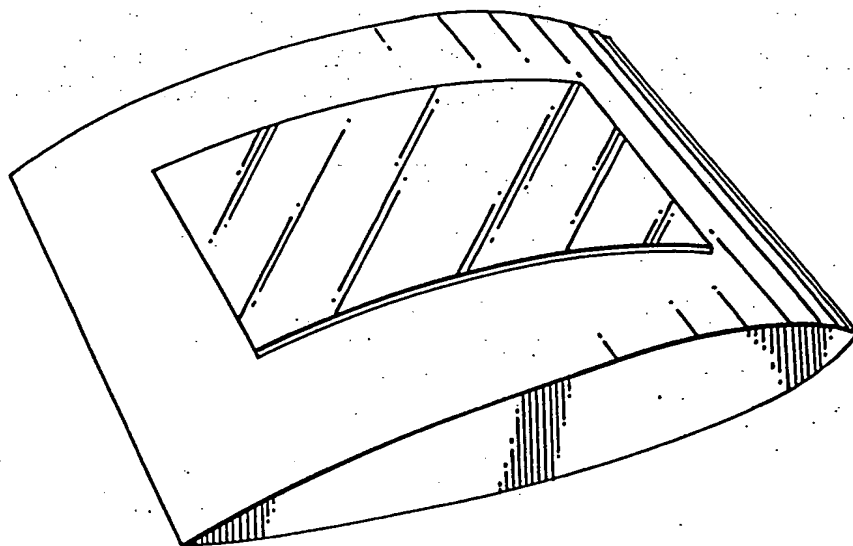


FIG. 7A

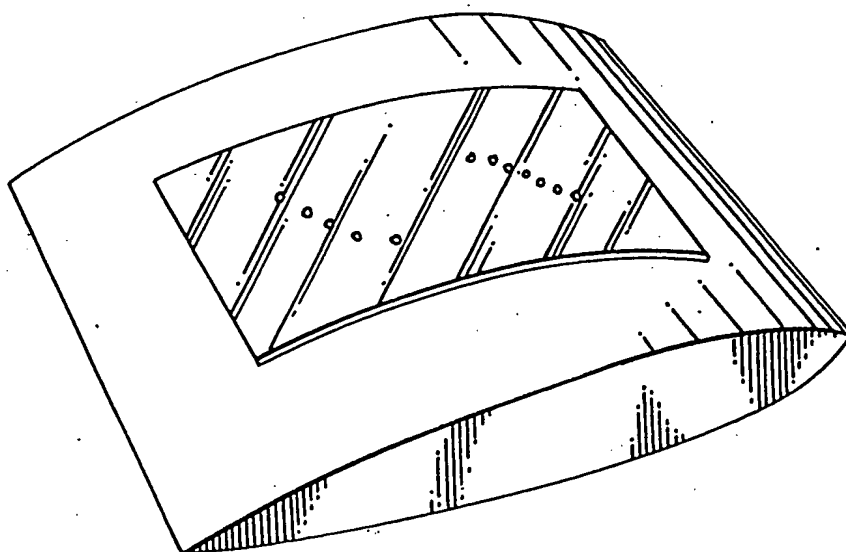
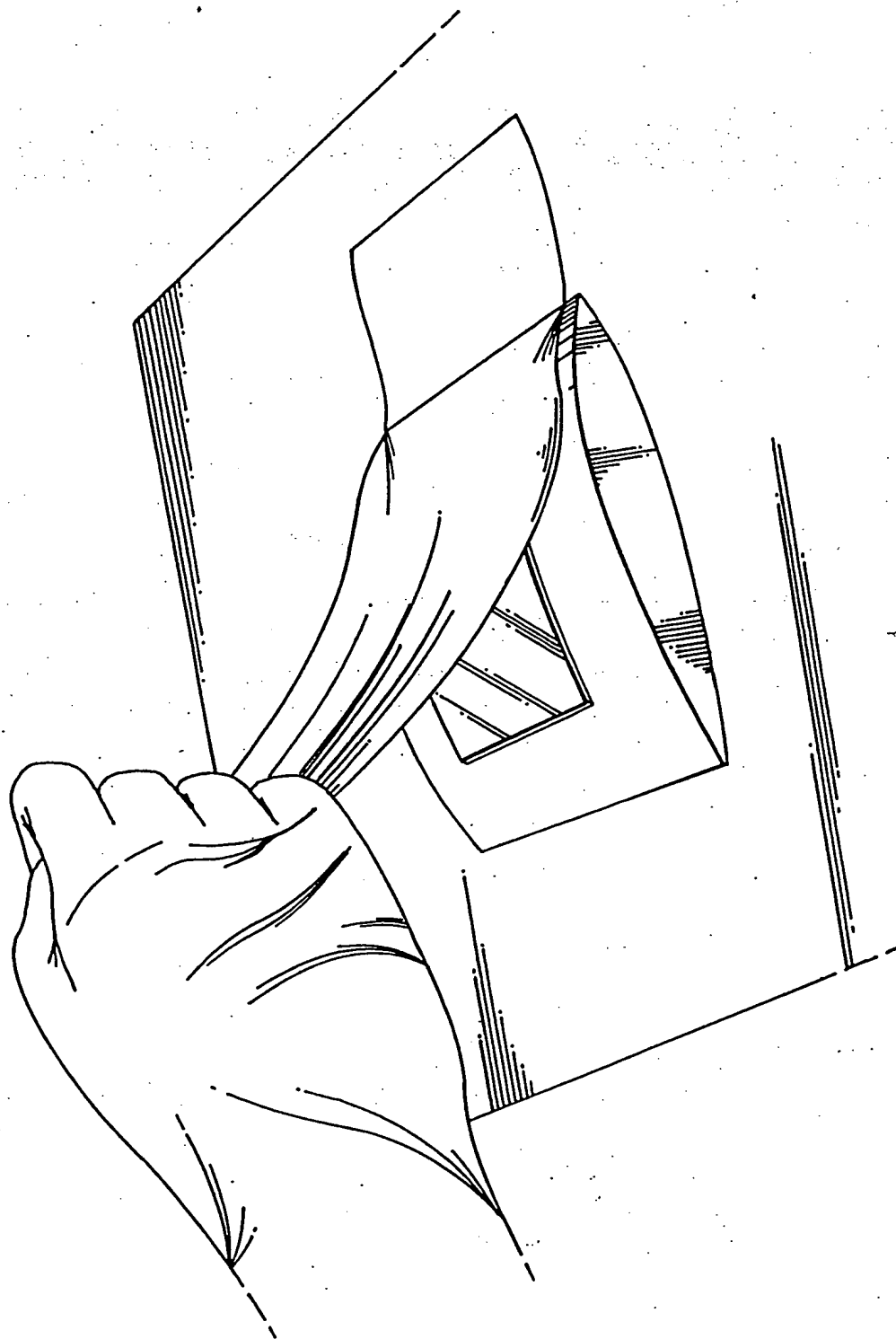


FIG. 7B

FIG. 7C



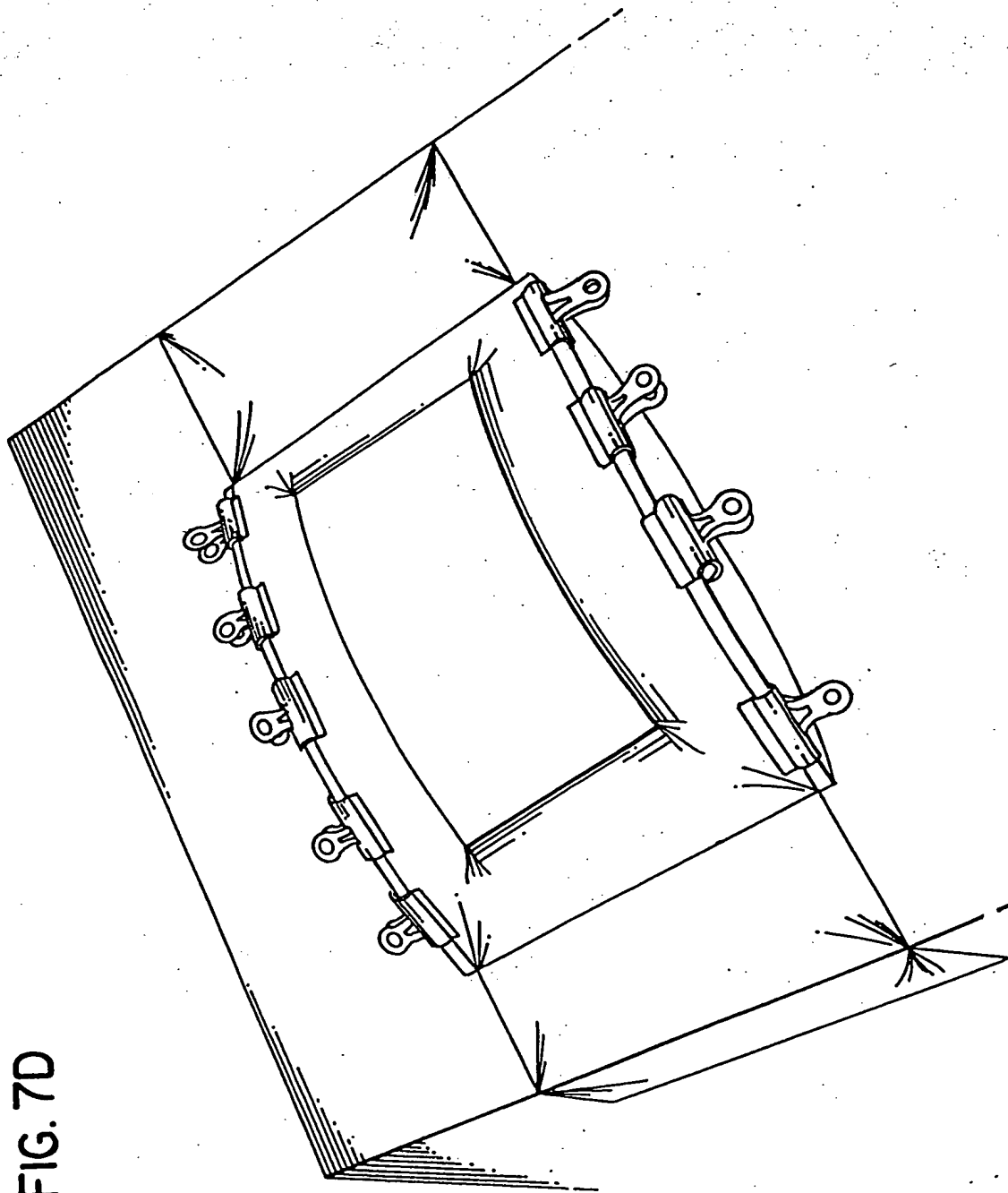


FIG. 7D